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Reconciliating Conservation and Sustainable Use of Biodiversity

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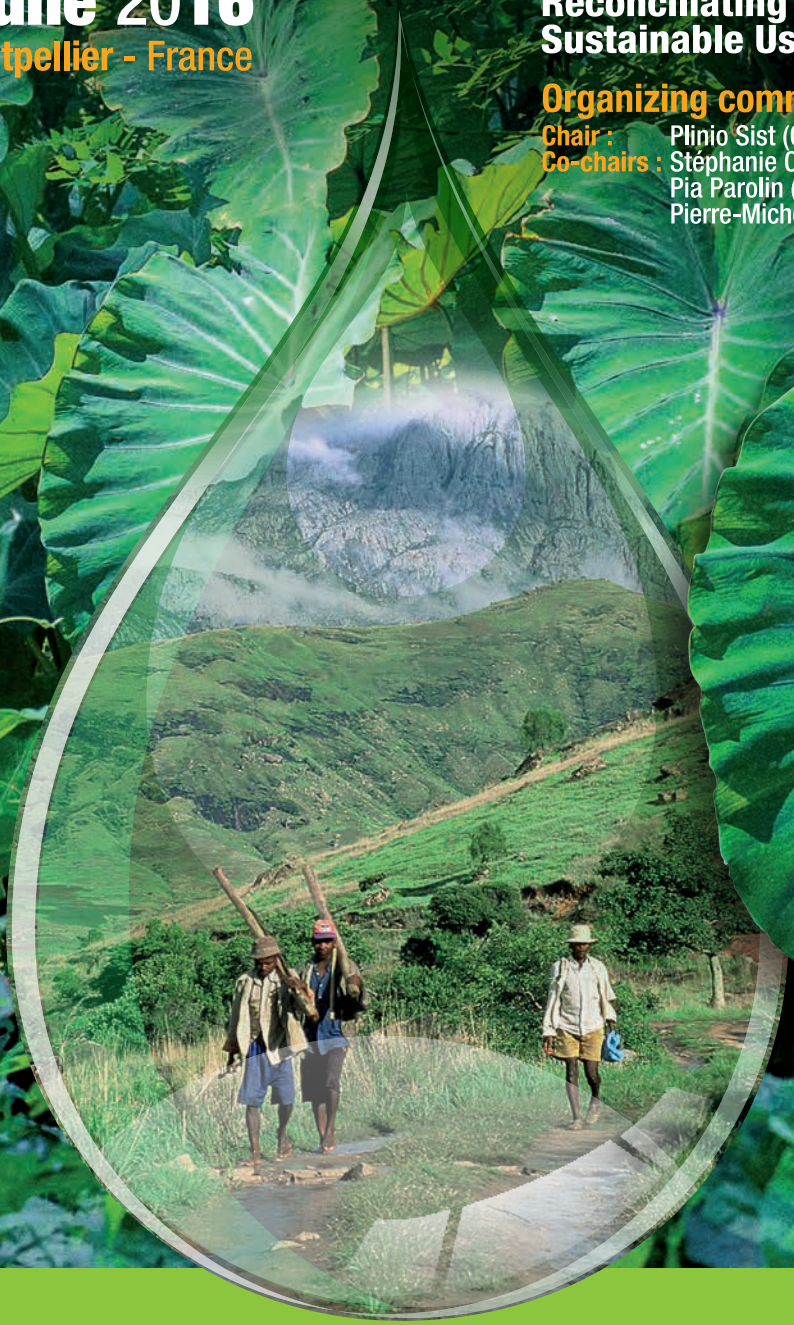

PROGRAM & ABSTRACTS

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O19-11 – S19 *Plant-microbial interactions in tropical forests: current advances and implications for human-modified environments*
Tuesday 21 June / 10:00-15:30 – Sully1

Plant-microbial associations across land use gradients in tropical forests

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Tropical forests are epicenters for macroscopic diversity, but only recently have modern molecular tools enabled the examination of tropical microbial diversity. Plant identity has been frequently cited as a key determinant of microbial composition, due to interspecific differences in chemical microsites that individual tree species create with root and litter inputs. However, land use, which is pervasive in tropical ecosystems, can also alter a myriad of biotic and abiotic factors that are known to affect soil microbial communities, and may modify aboveground-belowground linkages with consequences for plant dynamics and climate feedbacks. In the Luquillo Forest Dynamics Plot in Puerto Rico, we examined the interactive effects of tree identity and land use on structuring soil fungal communities. Specifically, we tested the following hypotheses: 1) Individual tree species have distinctive physical, chemical, phenological, and biological properties that create unique zones of influence, which result in distinct microbial signatures, 2) historical land use is a strong modifier of microbial signatures, and 3) the detection of plant-microbial associations is scale-dependent. We found support for the hypotheses that tree species have unique fungal signatures in the soil and litter for five abundant tree species across the forest dynamics plot. We also found that land use had a more significant impact on fungal composition, likely due to modifications of soil physicochemical properties, but that tree identity was still a factor in determining local scale fungal composition. However, the detection of these signatures was scale-dependent, highlighting the need to sample in a more targeted and definitive manner in order to test plant-microbial associations at the plot scale.

O19-12 – S19 *Plant-microbial interactions in tropical forests: current advances and implications for human-modified environments*
Tuesday 21 June / 10:00-15:30 – Sully1

From terrestrial to epiphytic orchids: do tropics change the rules as compared to temperate regions?

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In most mycorrhizal symbioses, including most adult green orchids, fungi provide soil minerals to the plant, in exchange for photosynthetic sugar. Yet, during orchid germination, the fungi, which belong to the polyphyletic rhizoctonias, provide carbon to germinating seedlings that have no reserve. Moreover, in some orchid species, adult plants also recover carbon from their fungi: some are achlorophyllous and non-photosynthetic (mycoheterotrophic species) while others are green but mix photosynthesis and exploitation of fungal carbon (mixotrophic species). Mixotrophic and mycoheterotrophic orchids have lost association to rhizoctonias, but connect (often with high specificity) to ectomycorrhizal fungi, so that their carbon issues from surrounding trees. But this scenario is mostly based on temperate studies – how is it challenged in tropical regions, where additionally most orchids are epiphytic? Our recent researches provide clues on this question. First, and although this was sometimes questioned, epiphytic orchids are always mycorrhizal. We characterized the orchid fungi across the natural habitats of Reunion Island (Pacific) and investigated the architecture of bipartite plant-fungal networks for 73 orchid species and 95 taxonomic units of mycorrhizal fungi. Unlike some recent evidence for nestedness in mycorrhizal symbioses, we found a highly modular architecture that largely reflected an ecological barrier between epiphytic and terrestrial sub-networks. By testing for phylogenetic signal in this network, it was stronger for both partners in the epiphytic sub-network. Moreover, in the sub-network of epiphytic angraecoid orchids, the signal in orchid phylogeny was stronger than the signal in fungal phylogeny. Epiphytic associations are therefore more conservative and may coevolve more than terrestrial ones. Second, our study of tropical mycoheterotrophic and mixotrophic orchids in the paleo- and neotropics revealed that specificity is not the rule and that, if rhizoctonias never support such orchids, the fungal associates can also be wood- or litter-decaying basidiomycetes. What allow these fungal guilds to support plant heterotrophy in the tropics remains unclear, but this suggests gaps in our knowledge of tropical fungal ecology. However, the constant exclusion of rhizoctonias further supports the idea that mycoheterotrophy at adulthood has different physiological bases than orchids mycoheterotrophy at germination.